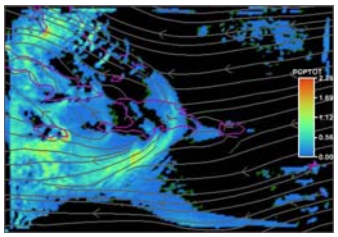
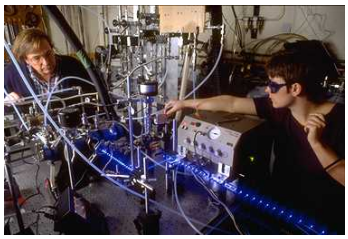
Earth System Research Laboratory

Integrating Research and Technology



Pictured is a 12-hour rain forecast provided by the Weather Research and Forecasting (WRF) model. The WRF model will greatly increase the accuracy and specificity of weather forecasts.



ESRL scientists conduct experiments concerning the chemical properties and reactions of atmospheric gases and particles to help improve NOAA's predictions in climate, air quality, and ozone depletion.

The South Pole Observatory.

NOAA's Science on a Sphere™ enthralls both children and adults as they learn about the atmosphere, land, oceans, and biology of the "whole-Earth" system.

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What does the Earth System Research Laboratory do for the nation?

The mission of the Earth System Research Laboratory (ESRL) is to observe and understand the earth system and to develop products through a commitment to research that will advance the National Oceanic and Atmospheric Administration (NOAA) environmental information and services on global-to-local scales. The work at ESRL includes: understanding the roles of gases and particles that contribute to climate change, providing climate information related to water management decisions, improving weather prediction, understanding the recovery of the stratospheric ozone layer, and developing the next generation of air quality forecast models.

Background

In 2005, NOAA's Office of Oceanic and Atmospheric Research ("NOAA Research") consolidated the six NOAA Research laboratories in Boulder, Colorado, into a single center: the Earth System Research Laboratory. This consolidation improves research and execution by having four thematic Divisions and a more effective and coordinated management structure. The consolidation also will result in better integration of science through the development of research and technology themes that are integrated across the Global Monitoring, Physical Sciences, Chemical Sciences, and Global Systems Divisions.

Recent Accomplishments

- Discovered new factors that cause ozone pollution in the Houston, Texas area and observed that leaks of reactive gases from petrochemical refineries prevalent in the region are a much larger factor than were previously expected. **Payoffs: NOAA's research findings regarding ozone pollution in the Houston area have altered the policy approach of Texas air quality managers, improving air quality forecasting in the area and saving 70,000 jobs and $10 billion for the state.**

- Established that forests and agriculture in North America are likely sequestering a sizable portion of the carbon dioxide produced by fossil fuel combustion in the U.S. **Payoffs: This finding indicates that forestry and agricultural practices could be modified to reduce the rate of increase of global carbon dioxide in the atmosphere.**

- Implemented a new and innovative research approach called an observational "testbed" method, which employs a suite of weather observation instruments to determine the best dataset that can be used to improve forecasts of precipitation and runoff in mountainous coastal regions. Such short-term forecasts in coastal areas are not as advanced as those in the interior U.S. because of limited offshore observations and the blockage of conventional weather radar beams by mountains. **Payoffs: The focus on testing new observing capabilities in regional testbeds translates into improvements in NOAA's observing system and forecasts. The improved forecasts have been used, for example, to mitigate the effects of major floods over the U.S. west coast.**

- Established a multiagency Developmental Test Center in Boulder to test new short-range numerical weather prediction techniques, which is initially focusing on the development of the Weather Research and Forecasting (WRF) model as both an operational model and as a research vehicle for the larger modeling community. **Payoffs: The WRF model will greatly increase the accuracy and specificity of weather and air quality forecasts.**

- Educated hundreds of students, teachers, and the general public about the changing Earth and its processes through Science on a Sphere™, which presents NOAA's global science in an exciting way through a three-dimensional representation of our planet as if the viewer were looking at the Earth from outer space. **Payoffs: Science on a Sphere™ has become a powerful and revolutionary system for educating the public on the holistic nature of the Earth's atmosphere, land, oceans, and biology.**

What's next for the Earth System Research Laboratory?

Over the next five to ten years, ESRL will work to:

- Improve understanding of air-sea, air-land, and air-ice interactions to advance and evaluate operational research models for weather, air quality, and climate.
- Improve understanding and capabilities to predict the connections of weather and climate phenomena.
- Coordinate basic research on climate and regional water systems with applied research on how such information can be used in adaptive management strategies.
- Improve short-range weather prediction on local and regional scales.
- Improve medium range weather forecasts on global scales.
- Develop and test new methods and tools to improve streamflow predictions, flood warnings, and drought monitoring.
- Quantify and understand the dynamics of sources and sinks of atmospheric carbon.
- Foster greater collaboration among partners to improve the dissemination of information relating to non-carbon dioxide atmospheric gases and climate change.
- Link the research and information on the impact of aerosols (airborne fine particles) on both climate and air quality.
- Increase activities in air quality monitoring and develop a new generation of prototype air quality forecast models and modeling techniques.
- Interpret trends in stratospheric ozone, the Antarctic ozone hole, ozone depleting substances, and surface radiation.

Research Partnerships

ESRL works with multiple partners, including NOAA's Cooperative Institute for Research in Environmental Sciences (University of Colorado), NOAA's Cooperative Institute for Research in the Atmosphere (Colorado State University), many partners within NOAA Research and NOAA, the National Center for Atmospheric Research, the National Aeronautics and Space Administration, and the Department of Energy. To include the necessary insights gained from research involving the biosphere and the oceans, ESRL is strengthening its partnerships with the NOAA Cooperative Institutes, with external constituencies, and with other NOAA laboratories that represent those areas of expertise.

Budget and Staff

ESRL's enacted budget for FY 2006 is $33.3 million. These budget numbers include items appropriated directly to the laboratory and do not include items appropriated elsewhere, such as those listed under Climate Observations and Services. The fiscal year 2007 President's budget request for ESRL is $35.6M. ESRL has a staff of over 550 working in its four Divisions, as well as approximately 20 staff who are performing the consolidated services of the ESRL Director's Office. These numbers include 115 permanent Federal employees and several cooperative institute and contract employees.

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